INSTRUCTION MANUAL

MODELS 2714 and 2719

Valhalla Scientific Inc.

Todd Shipyard

SPECIFICATIONS

MODEL 2714

Range	180 Day Accuracy (25°C ±5°C)	Maximum Current	Maximum Voltage	Power Dissipation	Power Coefficient
1 Ω	0.02%	1A	1 V	1W	0.3 ppm/mW
10 Ω	0.008%	300 mA	3 V	1W	0.3 ppm/mW
100 Ω	0.005%	100 mA	10 V	1W	0.3 ppm/mW
1K Ω	0.005%	30 mA	30 V	1W	0.3 ppm/mW
10K Ω	0.005%	10 mA	100 V	1W	0.3 ppm/mW
100K Ω	0.005%	2 mA	200 V	500 mW	0.3 ppm/mW
1M Ω	0.01%	200 uA	200 V	50 mW	0.3 ppm/mW
10M Ω	0.05%	20 uA	200 V	5 mW	0.5 ppm/mW
Short	<10μΩ	1 A			
Open	>10GΩ		200 V		

MODEL 2719

Range	180 Day Accuracy (25°C ±5°C)	Maximum Current	Maximum Voltage	Power Dissipation	Power Coefficient
1.9 Ω	0.02%	0.7A	1.3 V	1W	0.3 ppm/mW
19 Ω	0.008%	230 mA	4.3 V	1W	0.3 ppm/mW
190 Ω	0.005%	70 mA	13 V	1W	0.3 ppm/mW
1.9K Ω	0.005%	23 mA	43 V	1W	0.3 ppm/mW
19K Ω	0.005%	7 mA	130 V	1W	0.3 ppm/mW
190K Ω	0.005%	1 mA	200 V	200 mW	0.3 ppm/mW
1.9M Ω	0.01%	100 uA	200 V	20 mW	0.3 ppm/mW
19M Ω	0.05%	10 uA	200 V	2 mW	0.5 ppm/mW
Short	10μΩ	1 A			
Open	10GΩ		200 V		

GENERAL (Both Models)

Operating Temperature Range: 0°C to 50°C

Temperature Coefficient: (>30°C and<20°C): 5 ppm/°C all ranges except (50 ppm/°C above 40°C on 10MΩ/19MΩ range)

Input/Output Configuration: 4-Terminal or 2-Terminal

Residual Series Resistance (2-Terminal Mode Only): 80 milliohms typical on four lower ranges, 150 milliohms typical on upper ranges

Settling Time: 5 milliseconds to rated accuracy

Continued

SPECIFICATIONS (Continued)

Front Panel Controls:	Push-button power on/off switch and ten momentary action range switches
Indicators:	Ten LED range indicators plus power and IEEE-488 remote indicators
Power:	115/230 VAC, 50/60 Hz, 10 Watts
Size:	25 cm L x 43 cm W x 8.9 cm H (10″ x 17″ x 3.5″)
Weight:	4.5 Kg (10 lbs) net, 6 Kg (13 lbs) shipping

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SECTION I — GENERAL INFORMATION

1-1 DESCRIPTION

1-2 Valhalla Scientific's Model 2714 and Model 2719 Programmable Precision Resistance Calibrators have been designed to maximize calibration efficiency. Fingertip range selection minimizes the time required for calibration of digital ohmmeters, multimeters, VOM's and bridges. The Model 2714 provides eight decades of precision resistance from 1 ohm to 10 megohms. The Model 2719 also provides eight resistance range selections. However, they are 1.9 ohms, 19 ohms, etc., through 19 megohms. These ranges are particularly applicable to the calibration of digital ohmmeters and multimeters. In addition to the eight basic ranges, selectable "open" and "short" modes are provided for convenient "one-touch" verification of overrange and zero. Additional resistors may be installed by the user, permitting substitution of specific resistance values in lieu of the "open" and "short" conditions.

1-3 The internal resistance elements are aged and stabilized for maximum long-term accuracy. A four-terminal configuration eliminates contact and lead wire resistance errors. Since the internal resistances of the two calibrators have been minimized, they provide convenient two-terminal operation and compatibility with all two-terminal resistance measuring devices. A fully guarded circuit minimizes noise and leakage in either mode of operation. Accuracies of the Model 2714 and Model 2719 are traceable to the National Bureau of Standards.

1-4 As an option, either model may be remotely controlled through an IEEE-488 General Purpose Interface Bus (GPIB) meeting the requirements of IEEE Specification 488-1978.

1-5 The power supply for the control and GPIB Interface circuits of the Model 2714 and Model 2719 operate from 115 or 230 volt, 50-60 Hz AC commercial power. A detachable power cord is provided.

1-6 OPTIONAL EQUIPMENT

1-7 A number of optional equipment items are available to increase the utility of the Calibrators. These are described in the following paragraphs.

1-8 OPTION IEEE-488-L2

1-9 Option IEEE-488-L2 permits selection of ranges through the IEEE-488 General Purpose Interface Bus. The option consists of a small circuit board mounted inside the instrument and a 24-pin IEEE-488 connector and address switch on the rear panel. This option may be installed at the time the instrument is purchased or may be incorporated field retrofit.

1-10 OPTION "K"

1-11 Option "K" is a 48-inch shielded, four-wire Kelvin clip set, terminated in "KCS" gold-plated clips.

1-12 OPTION BBC

1-13 Option BBC is a 48-inch shielded cable with dual banana plugs on both ends.

1-14 OPTION RX3

1-15 Option RX3 is a rack mount adapter enabling the Model 2714 or Model 2719 to be mounted in a standard 19-inch equipment rack.

SECTION II — INSTALLATION

2-1 INTRODUCTION

2-2 This section of the manual contains information for receiving inspection and installation of the Model 2714 and Model 2719 Programmable Precision Resistance Calibrators.

2-3 INITIAL INSPECTION

2-4 If the shipping container shows evidence of in-transit damage, such damage should be immediately brought to the attention of the carrier and the nature of the damage noted on the bill of lading.

2-5 Unpack the instrument and retain the shipping container until the instrument has been inspected for possible damage in shipment. If in-shipment damage is observed, notify the carrier and obtain his authorization for repairs before returning the instrument to the factory. If the shipping container shows evidence of damage in transit, but the instrument does not, it may be advisable to perform the calibration procedure of Section V to determine that the instrument has not sustained internal damage.

2-6 POWER REQUIREMENTS

2-7 The instrument requires 115 or 230 volts AC, 50-60 Hz, at 10 volt-amperes. A detachable line cord with appropriate connectors is provided.

2-8 INSTALLATION

2-9 Installation requires only that the line cord be plugged into a power receptacle. Connection to the internal resistance elements is made through two binding posts on the front panel. Two additional binding posts serve as sensing outputs. These are connected directly across the selected internal resistance. They may be used to provide a sense input to the instrument undergoing calibration if it is equipped with sensing terminals. This will eliminate error due to the resistance of the leads between the instrument output and the input of the calibrator. If the IEEE-488-L2 option is installed, the instrument may be connected to a computer or controller through the IEEE-488 24-pin connector on the rear panel.

2-10 The Model 2714 and Model 2419 are intended for operation in environments where the temperature does not exceed 50°C (122°F). If higher temperatures are anticipated, external means must be provided to maintain the temperature around them at or below 50°C.

SECTION III — OPERATION

3-1 INTRODUCTION

3-2 This section of the manual contains complete operating instructions for the Model 2714 and Model 2719 Programmable Precision Resistance Calibrators.

3-3 REAR PANEL FEATURES

3-4 The line cord connector and the AC power fuseholder are located on the rear panel of the instrument. If the optional IEEE-488-L2 Interface is installed, a 24-pin interface connector and an address switch (S1) will also be located on the rear panel. The device address is a binary code that is set with the five sections of switch S1. The switch body is marked 1-2-4-8-16. When a switch is in the upward position, the bit corresponding to that number is set. There are thirty-two possible addresses that may be set from 00000 to 11111.

3-5 POWER CONTROL

3-6 A momentary contact POWER switch on the front panel is connected in a push-on push-off manner. Power is applied to the resistance selector relays with on depression of the switch and removed with the next depression. A green indicator in the POWER switch is illuminated when power is on.

3-7 SELECTOR CONTROLS AND INDICATORS

3-8 There are ten selectors mounted on the front panel, separated to form two groups. The group of eight switches select the resistance ranges. The two in the other group select the SHORT and OPEN modes. Each of these switches is equipped with a red indicator that is illuminated when its range or mode has been selected. Selecting a different range or mode will extinguish the indicator of the previously selected range or mode. The selectors are momentary push switches, requiring only fingertip pressure for operation. In response to pressing one of the range selectors, internal circuits operate a relay to connect the selected resistor to the input terminals. A second set of contacts on the same relay connect the sense terminals across the selected resistor.

3-9 Pressing the SHORT selector closes a relay that connects all four front panel terminals together. Pressing the OPEN selector also closes a relay that connects the "high" input terminal to the "high" sense terminal. The "low" input and "low" sense terminals are permanently connected together. In the OPEN mode, an open circuit exists between the "high" and "low" input terminals, and between the "high" and "low" sense terminals.

3-10 Panel markings below each of the range switches indicate the resistance range, the maximum allowable current and the resistance accuracy for that range in percent. Similar markings below the SHORT selector show the maximum current allowed, which is the current rating of the relay contacts, and the maximum resistance of the relay contacts. The markings below the OPEN selector show that no current will pass through the instrument when that mode is selected. They also show the minimum leakage resistance in this mode.

3-11 There are no special operating procedures for the Model 2714 and Model 2719. However, precautions should be taken, to observe the current limits for each of the ranges as indicated on the front panel so as not to damage the resistance elements. It is good practice to place the instrument in the "open" mode before turning the unit off. That will insure that, when it is next turned on, an externally connected device will not force current through one of the resistance elements in excess of its rating.

3-12 It should be noted that when the power cord is first connected to a wall receptacle and the unit then turned on with the POWER switch, none of the range indicators will be illuminated. Nor will any of the internal resistors be connected to the front panel binding posts. However, if a range is selected and the unit is turned off, that same range will be activated when the unit is again turned on. This last statement holds true only if AC power has not been disconnected from the rear of the unit.

3-13 REMOTE OPERATION

3-14 Remote operation is accomplished through the IEEE-488 Interface, Option 488-L2. When this

option is installed, a 24-pin IEEE-488 connector and a five section DIP switch are mounted on the rear panel. The address of the unit is set with the sections of the switch. Placing a section in the OFF position corresponds to a binary "1" in that position of the address.

3-15 The local or remote mode is selected only through the IEEE-488 Interface. It cannot be controlled from the front panel. However, if the unit is turned off when in the remote mode, it will return to the local mode when next turned on. When in the remote mode, the range and mode selection indicators light to shown which range or mode has been remotely selected.

3-16 Once the address of the unit has been received by the interface, it will respond to numerical data. If a different address is then received, the interface will not respond to data until its own address is again received. The numerical data to which the IEEE-488 Interface will respond are listed in Table 3-1.

Table 3-1. IEEE-488 Selection Codes.

CODE	SELECTED RANGE OR MODE
0	1/1.9 Ohms
1	10/19 Ohms
2	100/190 Ohms
3	1000/1900 Ohms
4	10K/19K Ohms
5	100K/190K Ohms
6	1M/1.9M Ohms
7	10M/19M Ohms
8	Short
9	Open

SECTION IV — THEORY OF OPERATION

4-1 GENERAL

4-2 This section contains descriptions of the circuits of the Model 2714 Programmable Precision Resistance Calibrator. The circuit if the Model 2719 is identical except for the values of the resistors selected for connection to the input terminals. The descriptions are referenced to the schematic diagram of Figure 5-5. Where several circuits are contained within a single device, each circuit is identified in this text by the device designator followed by a suffix number that indicates the pin on which the output of that circuit appears. For example, the S-R latch of IC10 with its output at pin 4 is designated as IC10-4.

4-3 POWER SUPPLY

4-4 The power supply consists of transformer T1, rectifiers CR1 and CR2, capacitors C1 and C2 and five-volt regulator IC1. The primary windings of T1 are connected in parallel for 115-volt operation and in series for 230 volt operation. A switch on the rear panel, which is operated using a screwdriver blade, provides the means for selecting 115 or 230 volt operation.

4-5 The output of IC1 is connected to all of the control circuits. However, it is not connected to the relay coils and LED indicators until the contacts of relay K11 are closed. Opening and closing of K11 is controlled by switch S1, S-R latch U10-4, one-half of dual flip flop IC8 (designated IC18-1), and Q1. When power is first applied to T1, C3 momentarily pulls pin 4 of IC8-1 high to reset it with its pin 2 high and pin 1 low. This turns off Q1 so that K11 is not energized. When S1 is closed, grounding pin 2 of IC10-4, the output of IC10-4 goes high, clocking IC8-1. Since pin 5 of IC8 was high, clocking it set its pin 1 high to turn on Q1 and energize K11. Because pin 5 of IC8-1 is then low, pin 1 will go low when IC8-1 is next clocked by a closure of S1. Thus, S1 operates in a push-on push-off mode.

4-6 LOCAL RANGE SELECTION

4-7 The local range selection circuit is composed of the balance of the devices shown in Figure 5-5 except those indicated as being part of the 488 interface board. IC7 is a one-of-ten-to-four decoder. Pulling one of its input lines high, generates a discrete binary code on its four output lines. Since all inputs are normally low, its output pin states are 0-0-0-0 and the output of NOR gate IC9-1 is high. When a switch is closed, the output of the respective S-R latch of IC10, IC11 or IC12 goes high, pulling an input of IC7 high. Since at least one of the output lines of IC7 then goes high, the output of IC9-1 is forced low. Pin 6 of quad latch IC3 is connected to ground, making the clock input of IC3 low-active. Thus,when IC9-1 goes low, IC3 is clocked and the states of its inputs are latched to its outputs and to the inputs of data selector IC4. When the switch is released, the output of IC7 returns to 0-0-0-0.

4-8 In the absence of a command from the IEEE-488 interface setting up the remote mode, LOCAL is high, selecting the outputs of IC3 as the inputs to four-to-one decoder IC5. The binary code at the input of IC5 forces one of its outputs low. This provides a current sink for one of the relay coils (K1 through K10) and one of the range indicators (DS2 through DS11). Energizing the relay coil closes its contacts. One set of contacts connects the appropriate resistor across the VHI and VLO terminals and the other set connects it across the IHI and ILO terminals. VHI and VLO are, of course, the input connections and IHI and ILO are the sense output connections. Closing a different switch will produce the same sequence. Since only one output of IC5 can be low at one time, the previously energized relay and indicator will be deenergized. Note that lighting of the range indicator shows which relay has been energized.

4-9 IEEE-488 INTERFACE

4-10 The IEEE-488 interface is controlled by a special device, IC6. This device incorporates most of the circuitry required to interface the Model 2714 to the General Purpose Interface Bus (GPIB) meeting the requirements of IEEE-488 1978. It contains its own clock oscillator which is controlled by crystal Y1. It is reset when K11 opens, removing +5V from its master reset ($\overline{MR}$) input.

4-11 When the ATN input to IC6 is low, it interprets the data on the bus as a command or as an

address. If the address on the bus matches that determined by the switches of S13, IC6 will accept the data or command which follows. One of the commands that must be received by IC6 is to place the Model 2714 in the remote mode. Output R/L and pin 1 of IC4 are then low, selecting the outputs of quad latch IC2 as the inputs to IC5. R/L being low also turns on Q2 to provide a current sink for REMOTE indicator DS12.

4-12 When the data on the bus is anything but numerical, data lines D5 and/or D6 will be high. This will force the output of IC13-3 and/or IC13-11 low, preventing IC6 from clocking latch IC2. When data is numerical, the outputs of IC13-3 and IC13-11 will be high. When the data has settled and DAV on the bus goes high, the R/L output of IC6 will go low to clock IC2, latching the data on lines D1 through D4 to its outputs. The data at the output of IC2, is then passed through IC4 to the inputs of IC5. IC5 operates on this data in the same manner as when it is from IC3 in the local mode.

SECTION V — MAINTENANCE

5-1 GENERAL

5-2 The Model 2714 and Model 2719 are designed for long life and should not require maintenance, except for periodic calibration to verify their accuracy. However, if a failure should occur, the defective component should be easily identified using ordinary troubleshooting procedures. It can then be removed and replaced with a new component. A review of the material in Section IV will provide all the technical information required for troubleshooting.

5-3 TEST EQUIPMENT

5-4 The following items of test equipment, or their equivalents, are required for calibrating the Model 2714 or Model 2719.

Voltage Generator, Valhalla Model 2701B
Current Calibrator, Valhalla Model 2500E
Voltmeter, Guildline Model 9577
Precision Resistors; 1Ω, 10Ω, 100Ω, and 10MΩ

5-5 CALIBRATION PROCEDURE

5-6 Before proceeding to calibrate the Model 2714 or Model 2719, it will be necessary to remove the top cover of the unit. Then remove the metal plate which is mounted over the main circuit board so as to gain access to the adjustments.

5-7 The Model 2714 and Model 2719 may be calibrated using the following procedure. A slash separates the model numbers in the procedure. The measured values for the two models are similarly separated.

1. Connect the equipment as shown in Figure 5-1.

2. Turn the 2714/2719 on and select the 10M ohm/19M ohm range. (For Model 2719, connect a 10MΩ ±0.005% resistor in parallel).

3. Adjust R23 on the main circuit board for a reading on the Model 9577 of 10/6.551724 megohms ±2500/660 ohms.

4. Select the 1M ohm/1.9M ohm range on the 2714/2719.

5. Adjust R24 on the main circuit board for a reading on the Model 9577 of 1/1.9 megohms ±50/95 ohms (0.005%).

6. Select the 100K ohm/190K ohm range on the 2714/2719.

7. Adjust R25 on the main circuit board for a reading on the Model 9577 of 100K/190K ohms ±2.5/4.75 ohms (0.0025%).

8. Select the 10K ohm/19K ohm range on the 2714/2719.

9. Adjust R26 on the main circuit board for a reading on the Model 9577 of 10K/19K ohms ±0.50/0.95 ohms (0.0025%).

10. Select the 1K ohm/1.9K ohm range on the 2714/2719.

11. Adjust R27 on the main circuit board for a reading on the Model 9577 of 1K/1.9K ohms ±0.050/0.095 ohms (0.0025%).

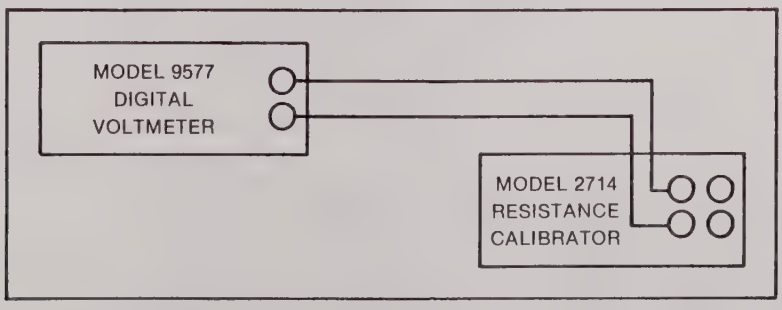

Figure 5-1. High Range Calibration Equipment Connections.

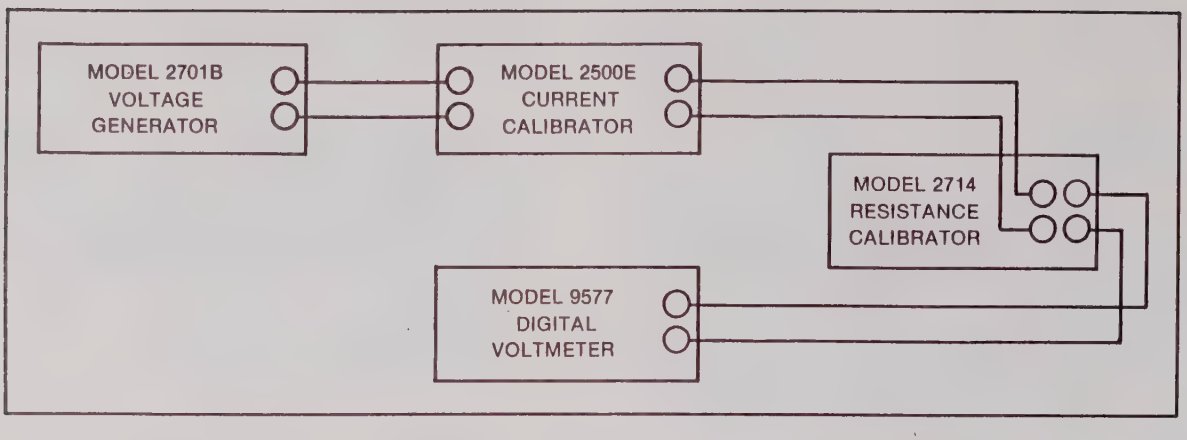

Figure 5-2. Low Range Calibration Equipment Connections.

12. Connect the equipment as shown in Figure 5-2.

13. Select the 100 ohm/190 ohm range on the 2714/2719.

14. Set the output of the Model 2500E at 10MA using a 100Ω ±0.001% resistor and the Model 9577 DVM.

15. Adjust R28 on the main circuit board for a reading on the Model 9577 of 1/1.9 volts ±0.000025/0.0000475 volts (0.0025%).

16. Select the 10/19 ohm range on the 2714/2719.

17. Set the output of the Model 2500E at 100MA using a 10Ω ±0.001% resistor and the Model 9577 DVM.

18. Adjust R23 on the main circuit board for a reading on the Model 9577 of 1.1.9 ±0.00004/0.000076 volts (0.004%).

19. Select the 1 ohm/1.9 ohm range on the 2714/2719.

20. Set the output of the Model 2500E at 500MA using a 1Ω ±0.003% resistor and the Model 9577 DVM.

21. Adjust R23 on the main circuit board for a reading on the Model 9577 of 0.5/0.95 volts ±0.00005/0.000095 volts (0.01%).

5-8 If the unit cannot be calibrated within the above limits, a defective resistor (or resistors) is indicated. The unit will then need to be repaired and calibrated prior to returning it to service.

V/S 2714 PROGRMMBLE RES CAL
GERRIT
-282-1053

APR 22

ID 85150 1Ω ± .15%

SW 34 4 22 10Ω ± .05%

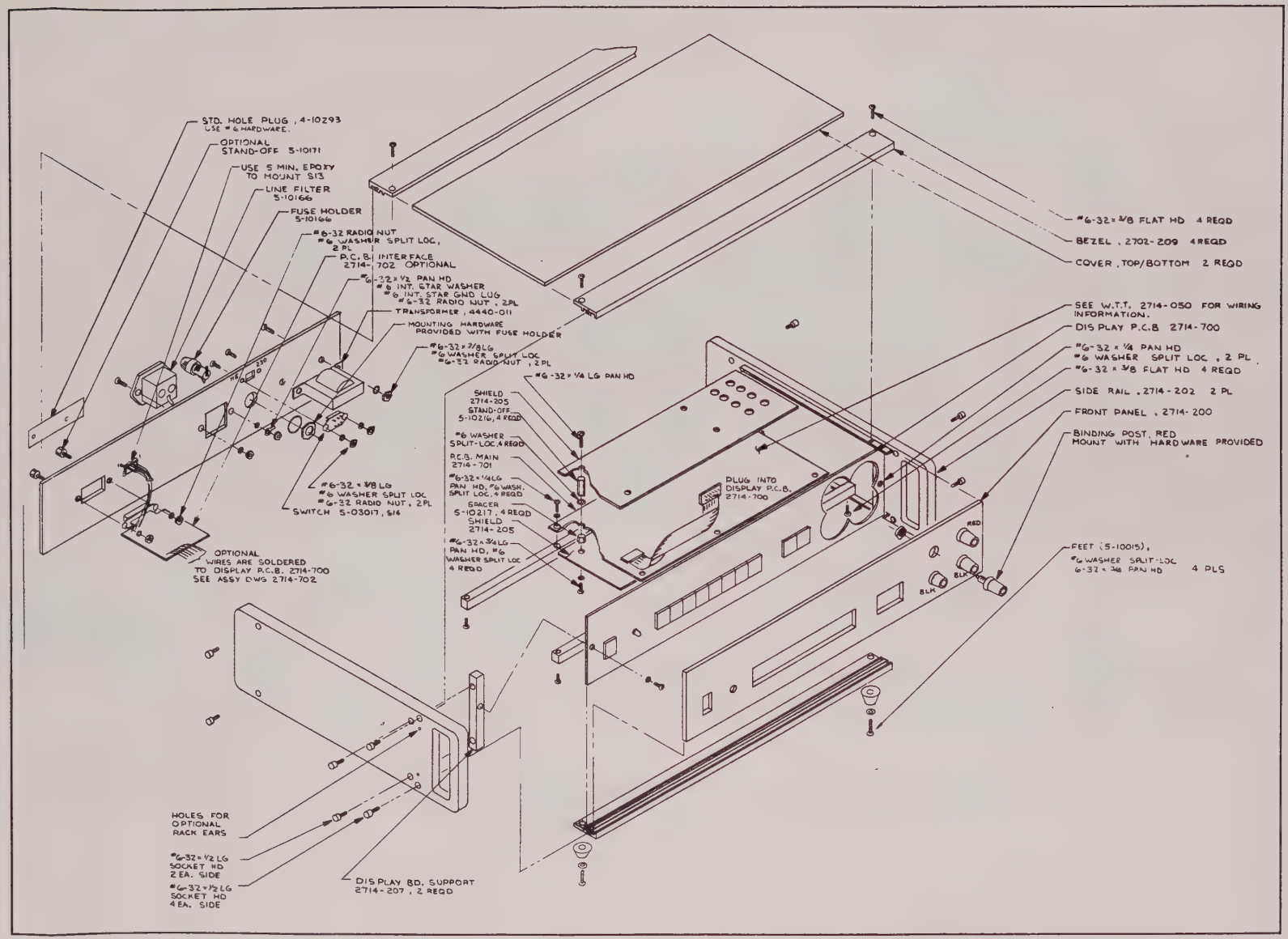
STD. HOLE PLUG, 4-10293
USE #6 HARDWARE.
OPTIONAL STAND-OFF 5-10171
USE 5 MIN. EPOXY TO MOUNT S13
LINE FILTER 5-10166
FUSE HOLDER 5-10166
#6-32 RADIO NUT
#6 WASHER SPLIT LOC, 2 PL
P.C.B. INTERFACE 2714-702 OPTIONAL
#6-32 x 1/2 PAN HD
#6 INT. STAR WASHER
#6 INT. STAR GND LUG
#6-32 RADIO NUT, 2PL
TRANSFORMER, 4440-011
MOUNTING HARDWARE PROVIDED WITH FUSE HOLDER
#6-32 x 7/8 LG
#6 WASHER SPLIT LOC
#6-32 RADIO NUT, 2PL
#6-32 x 1/4 LG PAN HD
SHIELD 2714-205
STAND-OFF 5-10216, 4 REQD
#6 WASHER SPLIT-LOC, 4 REQD
P.C.B. MAIN 2714-701
#6-32 x 1/4 LG PAN HD, #6 WASH. SPLIT LOC, 4 REQD
SPACER 5-10217, 4 REQD
SHIELD 2714-205
#6-32 x 3/4 LG PAN HD, #6 WASHER SPLIT LOC 4 REQD
#6-32 x 3/8 LG
#6 WASHER SPLIT LOC
#6-32 RADIO NUT, 2PL
SWITCH S-03017, S14
OPTIONAL WIRES ARE SOLDERED TO DISPLAY P.C.B. 2714-700 SEE ASSY DWG 2714-702
PLUG INTO DISPLAY P.C.B. 2714-700
HOLES FOR OPTIONAL RACK EARS
#6-32 x 1/2 LG SOCKET HD 2 EA. SIDE
#6-32 x 1/2 LG SOCKET HD 4 EA. SIDE
DISPLAY BD. SUPPORT 2714-207, 2 REQD
#6-32 x 3/8 FLAT HD 4 REQD
BEZEL, 2702-209 4 REQD
COVER, TOP/BOTTOM 2 REQD
SEE W.T.T. 2714-050 FOR WIRING INFORMATION.
DISPLAY P.C.B 2714-700
#6-32 x 1/4 PAN HD
#6 WASHER SPLIT LOC, 2 PL
#6-32 x 3/8 FLAT HD 4 REQD
SIDE RAIL, 2714-202 2 PL
FRONT PANEL, 2714-200
BINDING POST, RED MOUNT WITH HARDWARE PROVIDED
FEET (5-10015), #6 WASHER SPLIT-LOC 6-32 x 3/8 PAN HD 4 PLS
RED
BLK
BLK

Figure 5-3. Assembly Diagram, Model 2714/2719 Resistance Calibrator.

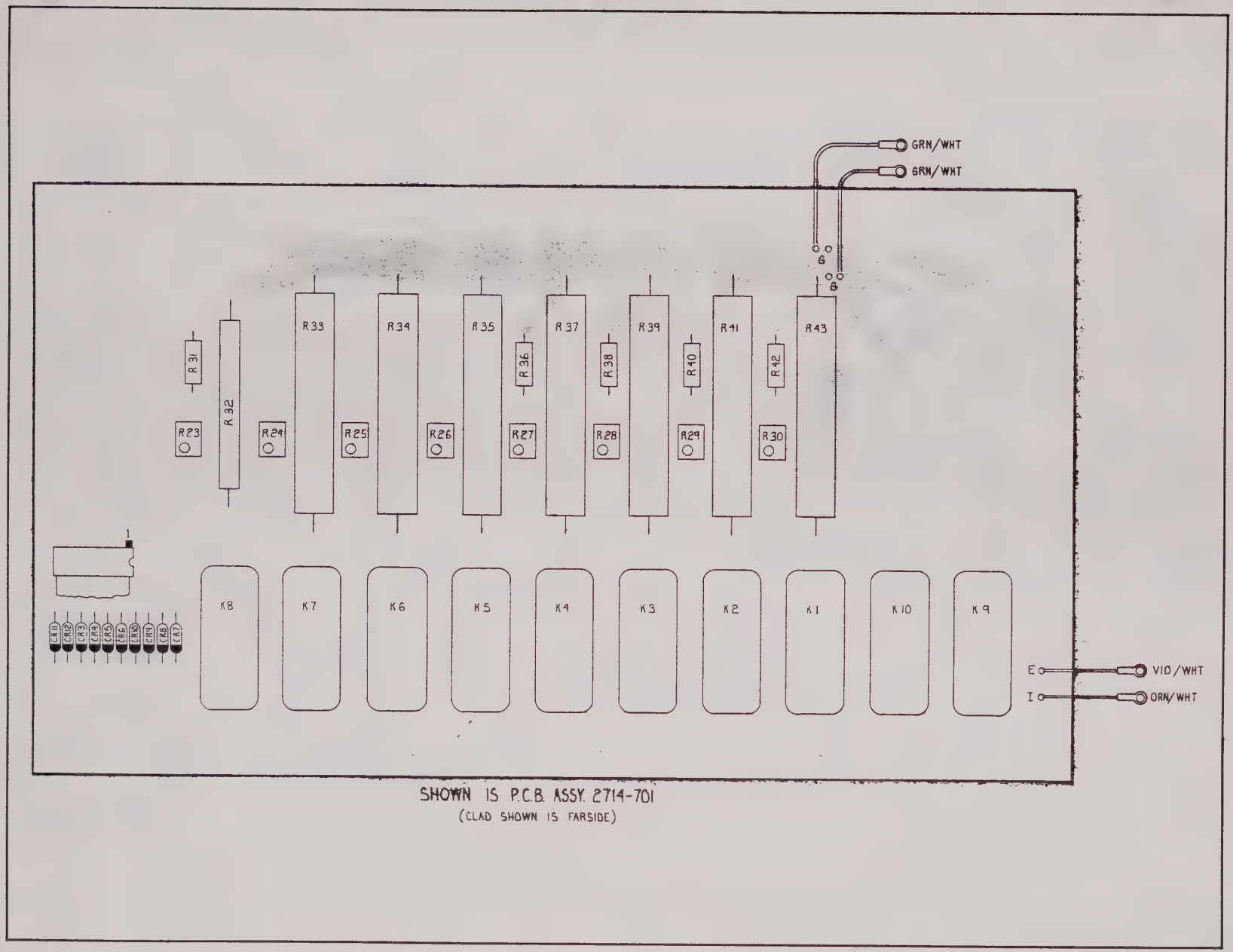

Figure 5-4. Assembly Diagram, Main Circuit Board.

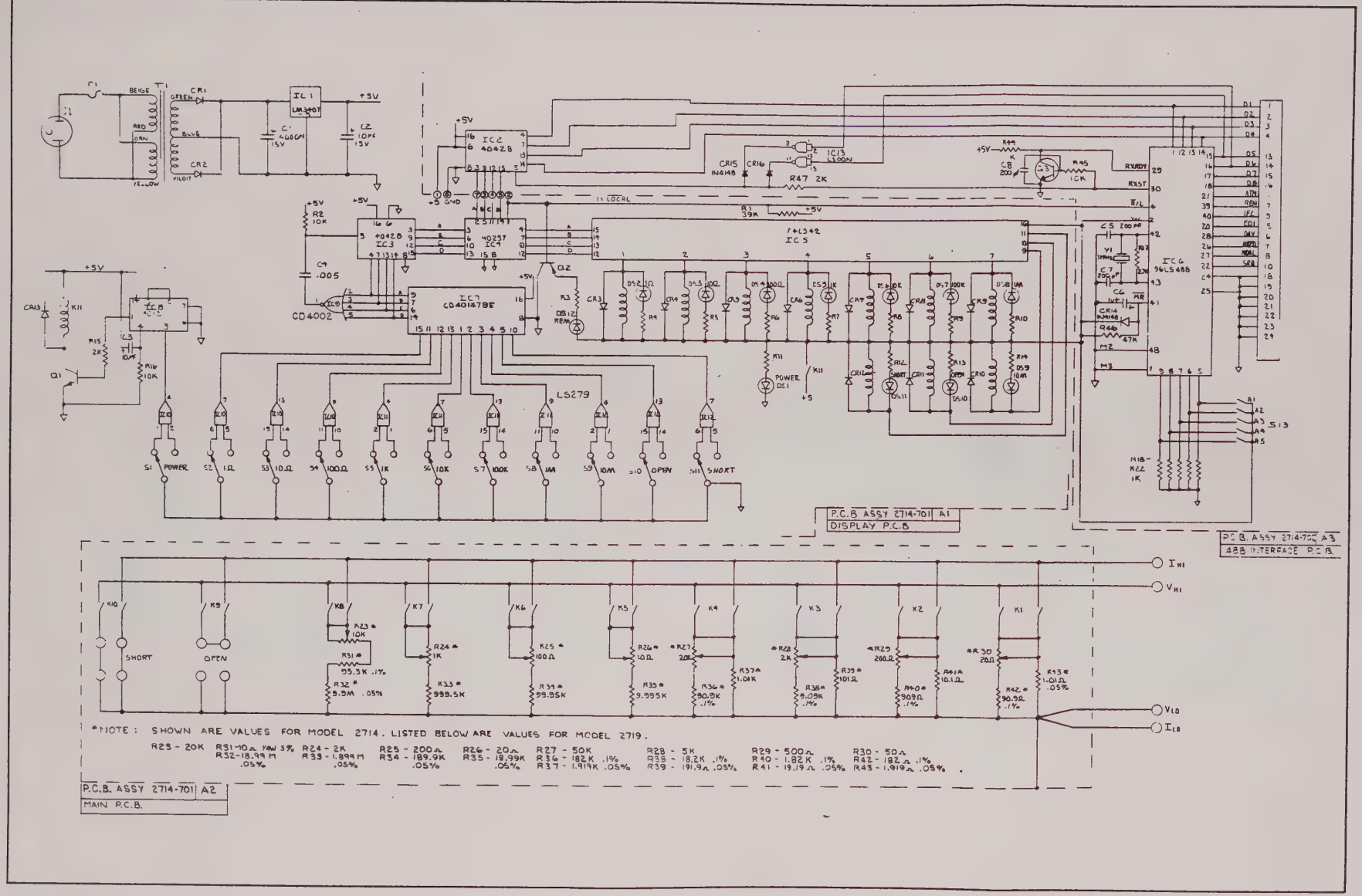

Figure 5-5. Schematic Diagram, Model 2714/2719 Resistance Calibrator.

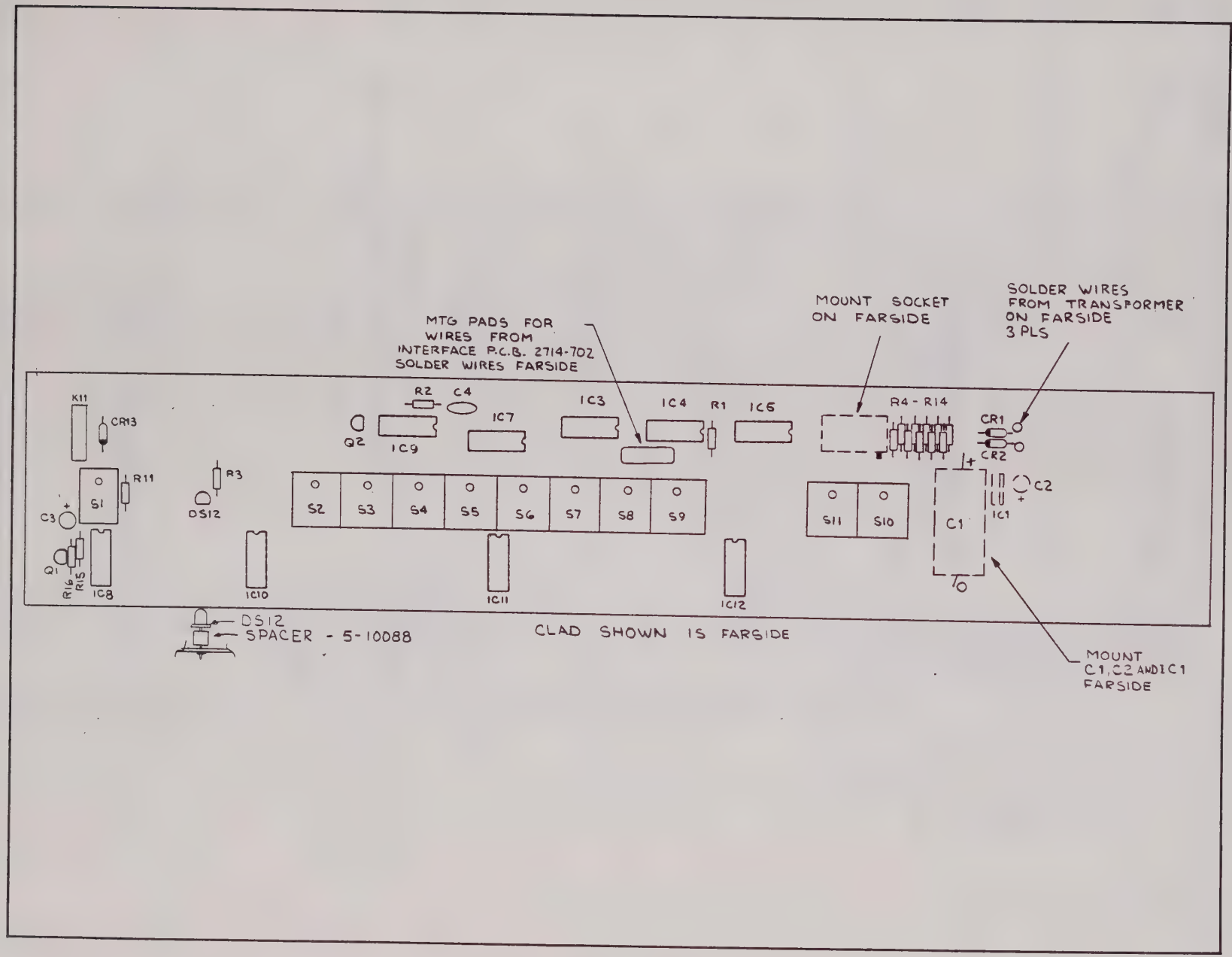

Figure 5-6. Assembly Diagram, Front Panel Circuit Board.

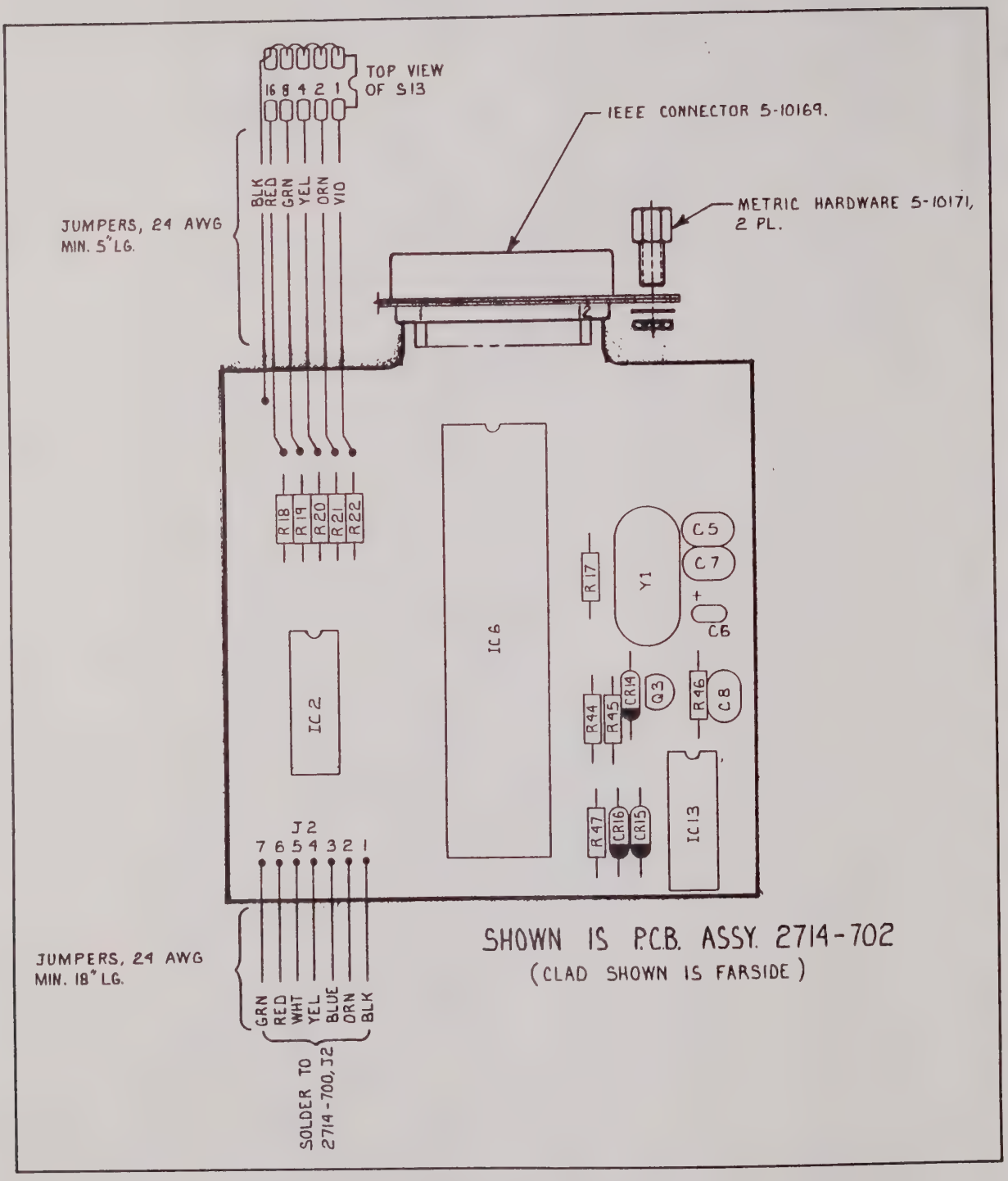

Figure 5-7. Assembly Diagram, IEEE-488 Circuit Board.

Valhalla Scientific Inc

PARTS LIST

REF. DES.	V.S. P/N	DESCRIPTION	MFG.	MFG. P/N
1 ea.	4-10271	FRONT PANEL	53504	2714-200
1 ea.	4-10272	REAR PANEL	53504	2714-201
2 ea.	4-10273	SIDE RAIL	53504	2714-202
2 ea.	4-10274	P.C. BOARD SUPPORT	53504	2714-203
2 ea.	4-10276	TOP & BOTTOM COVER	53504	2714-204
2 ea.	4-10275	SHIELD	53504	2714-205
2 ea.	4-10277	RACK BKT.	53504	2714-206
4 ea.	4-10264	BEZEL	53504	2702-209
1 ea. F1	5-10018	FUSE HOLDER	Littlefuse	342004A
1 ea.	5-10166	LINE FILTER	14655	APF600CEE
1 ea. J1	5-10067	POWER CORD	70903	17250
2 ea.	4-10278	DISPLAY BD. SUPPORT	53504	2714-207
1 ea. S14	5-03017	115-230 SWITCH	82389	46256LFR
12 ea.		6-32 x 1/2 Lg. ALLEN HEAD CAP.		SCREW
8 ea.		6-32 x 3/8 Lg. PHIL FLAT HD.		
2 ea.		6-32 x 1/2 Lg. PHIL PAN HD.		
6 ea.		6-32 x 3/8 Lg. PHIL PAN HD.		
6 ea.		6-32 HEX NUT RADIO PATTERN		
17 ea.		#6 INT STAR LOCK WASHER		
1 ea.		#6 INT STAR GND LUG		
T 1	4-20007	TRANSFORMER	53504	4440-011
2 ea.	5-10001	BINDING POST, RED	83330	1517-RED
2 ea.	5-10003	BINDING POST, BLK	83330	1517-BLK
10 ea.		6-32 x 1/4 Lg. PHIL PAN HD		
8 ea.		6-32 x 3/4 Lg. PHIL PAN HD		
1 ea.	4-10293	CONNECTOR PLUG	53504	2701-210
4 ea.	5-10217	SPACER #6 HOLE 1/4 Lg.	83330	2300
4 ea.	5-10216	STAND OFF #6 THD 3/4 Lg.	83330	2323
1 ea.	5-04000	FUSE .1 AMP	Littlefuse	.3 AG Sho Blo
4 ea.	5-10015	RUBBER FEET/Blk	08065	2084 W/701-Blk

See Schematic 2714-070
See W.T.T. 2714-050

MODEL: 2714/2719

TITLE: CHASSIS

SHT 1 OF 1

Valhalla Scientific Inc

PARTS LIST

REF. DES.	V.S. P/N	DESCRIPTION	MFG.	MFG. P/N
CR 3-12	3-20000	DIODE	04713	IN4148
K 1-10	5-03047	RELAY	COTO	CR3402-5-81
R 23	1-50039	RES VAR 20K	73138	68WR-20K
R 24	1-50038	RES VAR 2K	73138	68WR-2K
R 25	1-50037	RES VAR 200Ω	73138	68WR-200Ω
R 26	1-50036	RES VAR 20Ω	73138	68WR-20Ω
R 27	1-50028	RES VAR 50K	73138	68WR-50K
R 28	1-50040	RES VAR 5K	73138	68WR-5K
R 29	1-50029	RES VAR 500Ω	73138	68WR-500Ω
R 30	1-50033	RES VAR 50Ω	73138	68WR-50Ω
R 31	1-01007	RES FXD 10Ω	81349	RC07GF100J
R 32	1-10139	RES FXD 18.99MΩ	Caddock	1776-35-18.99MΩ
R 33	1-20096	RES FXD 1.899M .05%	00002	1-20096
R 34	1-20097	RES FXD 189.9K .05%	00002	1-20097
R 35	1-20098	RES FXD 18,99K .05%	00002	1-20098
R 36	1-10135	RES FXD 182K .1%	81349	RN60C1823B
R 37	1-20099	RES FXD 1.919K .05%	00002	1-20099
R 38	1-10136	RES FXD 18.2K .1%	81349	RN60C1822B
R 39	1-20100	RES FXD 191.9Ω .05%	00002	1-20100
R 40	1-10137	RES FXD 1.82K .1%	81349	RN60C1821B
R 41	1-20101	RES FXD 19.19Ω .05%	00002	1-20101
R 42	1-10138	RES FXD 182Ω .1%	81349	RN60C1820B
R 43	1-20102	RES FXD 1.919Ω .05%	00002	1-20102
1 ea.	5-10008	SOCKET 16 PIN DIP		CS3016B
1 ea.	4-30065	P.C. BOARD - MAIN	53504	2714-701

MODEL: 2719 | TITLE: MAIN BOARD | SHT 1 OF 1

Valhalla Scientific Inc

PARTS LIST

REF. DES.	V.S. P/N	DESCRIPTION	MFG.	MFG. P/N
CR 3-12	3-20000	DIODE	04713	IN4148
K 1-10	5-03047	RELAY	COTO	CR-3402-5-81
R 23	1-50012	RES VAR 10K	Beckman	68WR-10K
R 24	1-50013	RES VAR 1K	Beckman	68WR-1K
R 25	1-50014	RES VAR 100Ω	Beckman	68WR-100Ω
R 26	1-50018	RES VAR 10Ω	Beckman	68WR-10Ω
R 27	1-50039	RES VAR 20K	Beckman	68WR-20K
R 28	1-50038	RES VAR 2K	Beckman	68WR-2K
R 29	1-50037	RES VAR 200Ω	Beckman	68WR-200Ω
R 30	1-50036	RES VAR 20Ω	Beckman	68WR-20Ω
R 31	1-10122	RES FXD 95.3K .1%	81349	RN60C9532B
R 32	1-10030	RES FXD 9.9M .05%	Caddock	MFF2-8
R 33	1-20089	RES FXD 999.5K .05%	00002	1-20089
R 34	1-20090	RES FXD 99.95K .05%	00002	1-20090
R 35	1-20091	RES FXD 9.995K .05%	00002	1-20091
R 36	1-10038	RES FXD 90.9K .1%	81349	RN60C9092B
R 37	1-20092	RES FXD 1.01K .05%	00002	1-20092
R 38	1-10123	RES FXD 9.09K .1%	81349	RN60C9091B
R 39	1-20095	RES FXD 101Ω .05%	00002	1-20095
R 40	1-10124	RES FXD 909Ω .1%	81349	RN60C9090B
R 41	1-20093	RES FXD 10.1Ω .05%	00002	1-20093
R 42	1-10125	RES FXD 90.9Ω .1%	81349	RN60C90R9B
R 43	1-20094	RES FXD 1.01Ω .05%	00002	1-20094
1 ea.	5-10008	SOCKET 16 PIN DIP		CS3016B
1 ea.	4-30065	P.C. BOARD MAIN	53504	2714-701

MODEL: 2714 | TITLE: MAIN BOARD | SHT 1 OF 1

Valhalla Scientific Inc

PARTS LIST

REF. DES.	V.S. P/N	DESCRIPTION	MFG.	MFG. P/N
C 1	2-40000	CAP ELECT. 4000uf @ 15V	56289	39D408G015J4
C 2,3	2-30001	CAP TAN 10uf @ 16V	05397	T360B106M025AS
C 4	2-10000	CAP CERM .005uf	56289	5GAD50
CR 1,2	3-20002	DIODE	04713	IN4001
CR 13	3-20000	DIODE	04713	IN4148
DS 1-11		CONTAINED WITHIN S1-11		REF ONLY
DS 12	5-01011	LED, LARGE, RED	28480	5082-4655
IC 1	3-30034	IC POS. REG.	86684	LM340T-5
IC 3	3-30039	IC QUAD D LATCH	86684	CD4042BE
IC 4	3-30052	IC QUAD 2 LINE TO 1 LINE	86684	CD40257BE
IC 7	3-30137	IC 8 LINE to 4 LINE	86684	CD40147BE
IC 5	3-30131	IC BCD TO DEC. DECODER	86684	74LS42
IC 8	3-30026	IC DUAL D FLIP-FLOP	86684	CD4013BE
IC 9	3-30136	IC NOR GATE	86684	CD4002A
IC 10,11,12	3-30119	IC QUAD S-R LATCH	86684	74LS279
K 11	5-03012	RELAY REED	CLAIR	PRME1A005
Q 1	3-10013	TRANSISTOR NPN	04713	2N4401
Q 2	3-10010	TRANSISTOR PNP	04713	2N4402
R 1	1-01071	RES FXD 39K 1/4W 5%	81349	RC07GF393J
R 2,16	1-01061	RES FXD 10K 1/4W 5%	81349	RC07GF103J
R 3-14	1-01033	RES FXD 470Ω 1/4W 5%	81349	RC07GF471J
R 15	1-01045	RES FXD 2K 1/4W 5%	81349	RC07GF202J
S 1	5-03048	SWITCH PUSH-BUTTON	SCHADOW	SEAUOA0802G
S 2-11	5-03054	SWITCH PUSH-BUTTON	SCHADOW	SEAUOA0205R
1 ea.	4-30064	P.C. BOARD DISPLAY	53504	2714-700
1 ea.	5-10008	SOCKET 16 PIN DIP		CS3016B
1 ea.	5-10215	16 PIN INTERCONN. CABLE	53504	2702-053
1 ea.	5-10088	SPACER, 1/4 x 1/4	8330	2335

MODEL: 2714/2719 | TITLE: DISPLAY BOARD | SHT 1 OF 1

Valhalla Scientific Inc

PARTS LIST

REF. DES.	V.S. P/N	DESCRIPTION	MFG.	MFG. P/N
C 5,7,8	2-10001	CAP CEM 200pf	56289	5GAT20
C 6	2-30004	CAP TAN 1uf 25V	05397	T360B105M010AS
IC 2	3-30039	IC QUAD D LATCH	86684	CD4042BE
IC 6	3-30132	IC GPIB	07263	96LS488
IC 13	3-30045	IC QUAD NAND	86684	74LS00N
Q 3	3-10013	TRANSISTOR NPN	04713	2N4401
R 17	1-01048	RES FXD 2.7K 1/4W 5%	81349	RC07GF272J
R 18-22, 44	1-01041	RES FXD 1K 1/4W 5%	81349	RC07GF102J
R 45	1-01061	RES FXD 10K 1/4W 5%	81349	RC07GF103J
R 47		RES FXD 2K 1/4W 5%		
Y 1	5-02000	CRYSTAL 1MHz	81349	HC6-1MHz
S 13	5-03037	5 POS. DIP SWITCH	ALCO	DBS-5
1 ea.	5-10169	24 PIN CONNECTOR	02660	57-20240-2
1 ea.	4-30066	P.C. BOARD 488	53504	2714-702 B
2 ea.	5-10171	CONN. FASTENERS	USECO	1505A
R 46	1-01073	RES FXD 47K 1/4W 5%	81349	RC07GF473J
CR 14,15,16	3-20000	DIODE	07910	IN4148

MODEL: 2714/2719	TITLE: 488 INTERFACE BOARD	SHT 1 OF 1

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